

Lasers for Universal Microscale Optical Systems (LUMOS)
Frequently Asked Questions (FAQ) Document
12/5/2019

Q1: Our organization's expertise is focused on a specific part or components of the optical platform, but does not cover a complete LUMOS solution. How can we participate on the program?

A1: Proposals offering partial solutions will be considered incomplete as they will not address the full complement of program metrics and goals. Proposers are strongly encouraged to form multidisciplinary teams with broad expertise in order to contribute complete solutions to the respective technical areas.

Q2: Does TA2 have a wavelength preference?

A2: No. Any optical wavelength may be chosen to demonstrate TA2 metrics.

Q3: Can the TA2 laser power metrics be achieved through combination of multiple lasers through coherent combining at a single wavelength, through WDM combining, or with pulsed or mode locked lasers?

A3: The TA2 laser may be composed of any combination of gain elements, resonators, and other optoelectronic components that output coherent light meeting the BAA metrics and provisions. Coherent combining of multiple gain elements and injection-locking of lower-power lasers at the same frequency and phase is consistent with these goal and therefore acceptable. Summing optical power over multiple wavelengths is not. Note also that BAA TA2 provisions on the laser mode and side-mode suppression ratio will govern acceptable solutions.

Q4: Where is laser output power measured?

A4: Laser power is measured in an on-chip, passive waveguide coupled to the laser for routing and distribution.

Q5: Do TA3 metrics require a single gain material to span all wavelengths?

A5: No, per the BAA, approaches to TA3 can include heterogeneous integration of nonlinear photonics for parametric gain in combination with direct emission, as well as other approaches to broaden the optical gain bandwidth.

Q6: Can supporting electronics be located in a rack?

A6: Yes. While LUMOS requires a single-chip solution for all photonics components, including lasers and amplifiers, the electronic systems that may be needed to control the components and/or to operate the Phase 3 system demonstrations can be rack-mounted.

Q7: Are all photodetectors, modulators, and other optical components required to be on-chip?

A7: Yes, the goal of LUMOS is to develop complete single chip solutions.

Q8: Can materials development be part of a technical solution?

A8: Yes. Materials development may be needed, though all proposals must address the complete goals outlined within a TA, including laser integration on a complete platform. Any materials development that is part of your proposal should contribute to the goals of the TA and should be outlined in the technical description and statement of work.

Q9: Can I focus only on development of a specific component, i.e. modulator, photodetector, or other?

A9: All proposals must address the complete goals outlined within a TA, including laser integration on a complete platform. Innovative component research is expected to be performed as part of a larger effort or team.

Q10: What wavelength does the TA3 material loss metric apply to?

A10: As per the BAA, the waveguide loss metric applies across the entire spectral access range.

Q11: Can non-US foundries participate in TA1?

A11: The LUMOS program is open to all eligible proposers and is not restricted to US institutions. However, per the BAA, all institutions must address how they will meet the program and ERI goals of supporting domestic manufacturing capabilities and strengthening DoD access to differentiating technologies.

Q12: The LUMOS BAA frequently mentions heterogeneous integration. Is monolithic photonic integration on a native substrate allowed for TA2?

A12: DARPA expects that multiple materials may be needed to meet the program metrics, but will consider any solution that meets all the program metrics.

Q13: Is heterogeneous integration required in Phase 1?

A13: Any approach that will require heterogeneous integration to meet the end-of-program goals must demonstrate heterogeneous integration in Phase 1.

Q14: Do laser power specifications in TA3 apply to all wavelengths?

A14: Yes, all TA3 laser metrics must be demonstrated for each wavelength line.

Q15: Are sponsor letters required for abstracts?

A15: No.

Q16: What does “cost share encouraged” mean?

A16: Per the BAA, technologies and capabilities developed under TA1 funding have clear commercial applications, and performer cost share is highly encouraged. As noted in the Evaluation Criteria section, for efforts with a likelihood of commercial application, the level of performer cost share will be considered as a significant element of the Cost Realism evaluation.

Q17: How is intellectual property (IP) protected within the LUMOS program, including for gain blocks/components or PDK processes designed for TA1?

A17: Per the BAA, data rights assertions (restrictions) must be included in the proposal. For any selected proposal/s, this issue will be subject to negotiation prior to contract award. Proposers are reminded that data rights assertions (restrictions) will be reviewed as part of the proposal scientific review process (to assess any barriers to technology transition). Patent rights are not negotiable under a procurement contract - such rights are as stipulated in the applicable FAR/DFARS patent rights clauses. Patent rights are negotiable, to a certain extent (each case is different based on the nature of the project, performer cost share, etc.), under Other Transactions.

Q18: Is there a place where contracting mechanisms are compared to facilitate the decision of which approach to use?

A18: There is no formal instrument type comparison tool provided by DARPA. Each instrument type would have to be researched by the proposer. The website below (as noted in the BAA) does provide information focused on OTs and can provide some useful information:

<https://acquisitioninnovation.darpa.mil/>

Q19: Can we accelerate or change the program schedule defined by BAA?

A19: Accelerated schedules for some or all elements of the program are permissible, but not at the expense of delaying other elements. All metrics and milestones must be met on- or ahead-of-schedule per the BAA.

Q20: May TA1 laser wavelengths fall outside of the 1250 nm to 1600 nm range?

A20: Proposals to TA1 must include lasers and amplifiers operating in the 1250 nm to 1600 nm wavelength range, per BAA provisions identified in Table 1 footnotes.

Q21: For TA3, can nonlinear optical processes with on-chip pumping be used as a coherent light source at certain wavelengths?

A21: Yes, laser power at target wavelengths can be achieved through a combination of on-chip direct emission and on-chip nonlinear optical processes. Note that in these cases, laser WPE metric must include the power consumption of all pump lasers. Optical inefficiencies of nonlinear wavelength conversion should be discussed in the proposal.

Q22: What is the expected amount of funding for each team?

A22: Anticipated funding available for award has been provided on the BAA cover page, distributed by Technical Area. As indicated in the BAA, multiple awards are anticipated in each TA.

Q23: What is the right number of team members for each team?

A23: DARPA has no preference.

Q24: Is the same organization and/or the same co-PI allowed on multiple proposals within same TA?

A24: Yes.

Q25: For TA3, I already know which wavelengths are needed for my system demonstration. Do I need to provide additional wavelengths?

A25: In order to demonstrate the goals of LUMOS, DARPA will prescribe laser wavelengths that all Table 3 metrics will be tested against in each phase. System demonstrations proposed in TA3 are likely to require the development of additional optical sources tailored to performer needs.

Q26: Who will measure end-of-phase metrics, and are particular measurement methods expected?

A26: It will be the responsibility of the performer to develop a test plan appropriate for evaluating their technical approach and to measure all metrics in advance of the Metrics Evaluation milestones of each phase.

Q27: 2.5D integration was identified as not of interest in BAA. What do you consider to be 2.5D approaches?

A27: DARPA has amended the BAA to clarify this topic. Please reference the BAA Amendment 1 document for all instructions on proposing to the program.

Q28: In TA1, low loss silicon nitride waveguides are explicitly identified as a requirement. Are alternative materials acceptable if they meet the program metrics?

A28: DARPA has amended the BAA to clarify this topic. Please reference the BAA Amendment 1 document for all instructions on proposing to the program.

Q29: For TA1, is the use of SOI-based silicon photonics a strict requirement? Is it within scope of the BAA to deploy modulators and photodetectors by enabled by heterointegration?

A29: TA1 stipulates the use of silicon photonics, which implies the use of silicon wafers and advanced semiconductor device fabrication processes for integrated photonics fabrication on 8" or 12" wafers. The BAA does not stipulate wafer type, preferred fabrication processes, or materials used by platform components. LUMOS seeks to develop transformative PIC capabilities through heterogeneous integration of materials, and TA1 places a strong emphasis on developing on-chip optical gain for mature platforms.

Q30: Is the TA3 laser tuning range metric defined relative to the carrier wavelength?

A30: The BAA defines the laser tuning range of TA3 sources in percentage form and applies to each laser wavelength within the spectral window. The tuning percentage is relative to the laser carrier wavelength but the BAA does not prescribe a minimum or maximum wavelength. For example, the wavelength of a light source at 900 nm must be tunable by a total of 9 nm, which could be achieved by tuning from 895 – 904 nm, 900 – 909 nm, 891 – 900 nm, etc. and without loss of generality. Likewise, a light source at 400 nm must be tunable by a total of 4 nm in the same fashion.